

rugose-punctate, transversely impressed near the base; centre of disk with a longitudinal groove. Elytra broader than the thorax, oblong, sides narrowly margined, their outer edge, together with the apical border, serrate; apex rounded; above convex; each elytron with eight rows of deep regular punctures, interstices obsoletely costate.

A single specimen, without locality, in my own collection.

Microrhopala Salléi, n. sp.

M. anguste ovata nigra; thoracis vittis duabus elytrorumque vitta lata humerali, a basi fere ad medium producta, postice angustata, fulvis; elytris profunde punctato-striatis, interspatiis alternis obsolete vittatis.

Long. 2 lin.

Hab. Guatemala, Mexico.

Thorax transversely excavated at the base, deeply punctured, a longitudinal fulvous stripe on either side, just within the lateral border, continuous with the humeral patch on the elytra; sides of the elytra subparallel, scarcely oval, finely toothed.

In my own cabinet; also sent me for examination by M. Sallé and Rev. H. Clark.

[To be continued.]

XXXII.—*On the remarkable Means by which certain Species of Parasitic Crustacea effect their Conservation.* By M. EUGÈNE HESSE*.

THE object of my present paper is to call attention to the means by which the conservation of their species is assured to certain parasitic Crustacea, such as the *Trebia*, the *Caligi*, the *Pandora*, and the *Chondracanthi*.

All carcinologists are aware that many of these singular animals, which, on their issuing from the egg, are furnished with powerful instruments of locomotion, are, on the contrary, very insufficiently provided with them when in the adult state, some being even completely deprived of them; that, moreover, there are some to which organs of vision have been denied, sometimes in the males, sometimes in the females; so that these disinherited creatures become perforce stationary, and are compelled to follow the fortunes of the fishes at whose expense they live.

In this situation, so perilous to the species, it is easily con-

* Translated by W. S. Dallas, F.L.S., from a separate impression, communicated by the author, of his paper in the '*Mémoires des Savants Etrangers*.'

ceivable that, if the provision which presides over the conservation of all existences did not come to the aid of these degraded Crustaceans, they would speedily disappear, or, at least, that an entire family would perish with the fish which served it at once as a prey and a place of shelter. It is, therefore, of great importance to prevent such a result. I propose to see whether the facts which I have ascertained may justly be regarded as destined to provide against this destruction.

It is not rare to find female *Trebie*, *Caligi*, *Pandoræ*, and *Chondracanthi* to which young Crustacea of the same species are affixed by a cord, which, although it cannot be called *umbilical*, may be denominated, by analogy, the *frontal cord*. This bond which unites the embryo with its mother does not fulfil functions analogous to those of the umbilical cord in the higher animals, but is destined simply to unite the one to the other. Attached by one of its extremities to the anterior part of the frontal margin of the young Crustacean, it is affixed by the other end to the body of the mother, by means of a circular dilatation in the form of a sucker; and it is sufficiently long and flexible to allow the young Crustacean to act to a certain extent independently of its mother, without disturbing her movements, and to apply itself to the fish upon which they live in common.

It is a spectacle at once surprising and interesting to see these embryos (especially those attached to the *Trebie* and *Caligi*, which swim with tolerable rapidity) following the evolutions of their mother like a little boat towed along by a larger vessel, or, again, as a fish attached to a line which keeps it a prisoner, yields to the traction which is thus exerted upon it.

What is the purpose of this curious union? Is it possible to assume it to be the effect of chance, when analogous facts are frequently presented, and have been proved to occur, in several species of these Crustacea? Can it be supposed that it is for the purpose of the alimentation of the embryo by the mother, when the bond of union does not establish any internal relation between them, and they each obtain their own nourishment? I think not; and we must therefore assume that there is some other motive.

If we assume that this young Crustacean is a male, and that the female, seizing a favourable opportunity, passes, carrying it with her, from the fish on which they were living together, to another, we shall at once perceive the consequences of this transmigration, which, uniting in itself all the elements necessary for reproduction, allows this female and the male which accompanies her to found a new colony. This supposition does not appear to me improbable; for, of two things, one must be

true in this case: either chance presides in this union of the young Crustacean to its mother, or it has nothing to do with it.

On the former hypothesis, as the embryo must be either male or female, it is evident that it may sometimes be a male, and then matters would go on as above described; if, on the contrary, it is a female, the conditions of which I have just spoken would certainly no longer exist, but this migration would still have a very useful purpose, since it would transport from one fish to another a young Crustacean, which perhaps might have been unable to perform this migration of itself and by its own powers, and thus contribute to dissemination, which is one of the most essential elements in the conservation of the species; moreover, there is nothing against these females meeting with males in their new position.

The second supposition is the most probable one, in my opinion. Indeed, how can we explain the development of so extraordinary an apparatus at the anterior part of the frontal margin of these young Crustacea without assuming some important motive for the production of this modification? and no reason can well possess more importance than the conservation of the species. Moreover it would be very difficult for creatures so feeble and so destitute of organs of adhesion to maintain their position and resist the action of the waves, which is the more powerful in proportion to the rapidity of progression of the fish on which they occur.

However this may be, I leave these facts as ascertained by me for the appreciation of those who are willing to seek for their solution, which, however, in my opinion, can hardly be other than that indicated by me.

As already stated, the frontal cord is very flexible, especially in its middle part; it is hollow, cylindrical, and covered with a few hairs, and becomes rigid and brittle near the frontal margin; so that it might be broken before the proper time, if another combination had not been made to avoid the possibility of such accidents.

In most of the young Crustacea furnished with this apparatus there exists an articulation below the antennæ and the eyes, which allows this part of the head to bend as if it were borne upon a neck; so that by this means sudden and violent shocks are avoided, as well as the accidents which might be produced by them. A time comes, however, when rupture is necessary,—namely, when the young Crustacean, becoming able to procure its own nourishment, has no longer any need of its mother. It then takes place close to the frontal margin, where here is a sort of umbilicus, which subsequently diminishes and

disappears in such a manner as no longer to present anything abnormal. I cannot say whether this structure is exceptional, from the difficulty of preserving for some time alive such small Crustaceans, which feed only on the blood of fishes, and, consequently, of following exactly all the transformations which they undergo. It is certain, however, that, at the moment of their exclusion from the egg, they do not present this singular appendage, and that it is only at the second or third change of skin that it makes its appearance in those which acquire it. It will be necessary to examine more minutely than I have yet done the bodies and branchiæ of fishes in order to ascertain that the parasites do not attach themselves by this means. I remember, however, having seen some young *Caligi* attached to the branchial laminæ of a fish by a cord of this kind; so that this may be more common than I suppose.

The form of the young Crustacea attached to their mother is perfectly adapted to their situation: it is oval, flat, attenuated at the two extremities, and shaped like a little boat, for the purpose of facilitating natation and offering the least possible resistance to traction.

In this state, the cephalic buckler, which is triangular, presents at each side of the head two antennæ, of greater or less length, composed of two joints, and terminated by some rigid hairs. The eyes are very large, pressed close together, and placed above at the middle of the thorax.

The abdomen is generally divided into five segments, of which the first is the largest; the hindmost is terminated by two processes furnished with very long and stiff hairs, four in number, the two median ones being the longest.

Beneath, near the antennæ, and on each side of the head, are the two first thoracic feet, which are more or less developed and composed of two articulations, terminated by a very strong hooked claw.

The head is oval, rounded at the apex, and pointed at the lower extremity, which is conical, and forms the sucker; below this, according to the more or less advanced stage of development, we may perceive a furrow, which is also seen in the adult *Trebiæ* and *Caligi*.

Below the first thoracic feet those of the second pair are observed, armed with two crooked claws: these are followed by the third pair, terminated by a single claw.

The abdominal false feet vary according to the species; they generally consist of flat flabelliform joints, fringed with strong hairs, and serving for propulsion.

The ova of *Trebiæ*, *Caligi*, and *Pandoræ* are piled together in the oviferous tubes like pieces of money in a rouleau. Those of

the *Chondracanthi*, on the contrary, are packed together in layers. The eggs never contain more than one vitellus.

The young Crustacea of these various species do not disperse themselves immediately after their escape from the egg; they remain for some time fixed upon the oviferous tubes, from which they afterwards dart in pursuit of their prey, or establish themselves upon the surface of the fish on which they have been hatched.

They swim rapidly and in gyrations, by means of the six biramous feet terminated with long hairs, which they agitate with great force. I have remarked that when an opaque body is passed rapidly above the vessels in which they are kept, their movements become much more rapid, which leads me to think that the shadow resulting from the interposition of this body between them and the light produced for them the same effect as that of the passage of a fish within their reach, and which they endeavoured to seize.

In the centre of these young embryos we observe the stomach, which, not being yet filled with food, appears nevertheless to be distended, as if it contained air, and may assist in facilitating progression by sustaining them and performing the office of a swimming-bladder.

The young Crustacea, after their escape from the egg, may exist without nourishment for from three to fifteen days when they are preserved in vessels filled with very pure sea-water and kept in a dark and cool place. There are species which live for a considerable time; but generally the embryos of the *Pandora* and *Chondracanthi* die before those of the *Trebiæ* and *Caligi*, which, moreover, are more lively in their movements than those of the former Crustaceans. I have also ascertained that the life of the embryos attached to their mothers by a frontal cord lasted much longer than that of those preserved separately in water, which they survived for a long time, and even until decomposition had set in: this is a curious fact, which seems to me to be evidently in connexion with the prevision which presides over the conservation of species.

Note.—Since writing this memoir, I found, on the 8th of June 1863, on the gills of *Merluccius vulgaris*, a female *Chondracanthus*, to which two male individuals, arrived at their perfect development, were attached by a frontal appendage. This evidence seems to me to convert the hypothesis above proposed by me into a certainty, and to confirm my supposition that the males, for the purpose of propagation, attach themselves artificially to the females by the singular means which I have described.